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LUIS E. ARAGÓN,
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RESEARCH SUPPORT IN BRAZIL¹

Simon Schwartzman²

Government support to scientific research in Brazil dates back to the 1950's, with the creation of the National Research Council (*Conselho Nacional de Pesquisas* - CNPq) as an agency under the auspices of the Republic's Presidency. Initially, the main research institutions of the country were attached to the ministries of the federal government, as the *Instituto Oswaldo Cruz* (tropical medicine), and the *Instituto Nacional de Tecnologia do Rio de Janeiro* (industrial technology); to the state government of São Paulo, as in the case of *Instituto Biológico de Defesa Animal* (biological research in agriculture), the *Instituto Butantã* (snake venom research) and the *Instituto de Pesquisas Tecnológicas* (industrial technology); or to the two main universities of the country, namely the University of São Paulo and the University of Brazil (nowadays Federal University of Rio de Janeiro). Scientists from France and Germany had a significant presence in Brazil's main museums and research institutions since the late nineteenth century, and Americans participated in the creation of the first Geological and Geographical Commissions. Since the 1920's the Rockefeller Foundation had been supporting research and education in medicine and public health, and participating in national campaigns for the control of tropical diseases. In the forties and fifties, the Rockefeller Foundation provided fellowships for a significant number of outstanding researchers in the fields of physics, genetics and other areas, to complete their higher education and training in Europe and the United States (Schwartzman 1991).

The present system of research support was formed during the 1970's. The main governmental agency is the Ministry of Science and Technology, directly under the Republic's Presidency, to which the National Council of Scientific and Technological Development (*Conselho Nacional de Desenvolvimento Científico e Tecnológico*) and the Financing Agency for Studies and Projects (*Financiadora de Estudos e Projetos*)(FINEP)

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² Doctor in Political Science by the University of California, Berkeley, author of *A Space for Science: The Development of the Scientific Community in Brazil*, and professor of the University of São Paulo.

are attached. There are four other institutes that come under the Ministry, the Institute of Space Research, the Center of Technology for Informatics Foundation, the National Institute of Technology and the Institute of Research of the Amazon. The National Council of Science and Technological Development is the successor of the old National Research Council (CNPq) from which it still maintains the abbreviation (Albagli 1987; Cagnin e Silva 1987; Romani 1982). In the 1970's the Council was transferred from the Presidency to the Ministry of Planning, with a mandate to broaden its activities to the areas of industrial technology, regional development, international cooperation, scientific information and others. Apart from this, CNPq took on the direct control of a group of research institutions with very diverse origins, such as the Brazilian Center for Physics Research, the Institute of Pure and Applied Mathematics, the Goeldi Museum in the state of Pará and the National Observatory in Rio de Janeiro.

FINEP was organized in 1967, originally as a public corporation responsible for financing the activities of consulting firms working in feasibility studies for engineering projects, as pre-investments which were deemed necessary for government support. Its main source of income was a fund for technological development created by Brazil's National Bank for Economic Development (BNDE). In 1969, the Brazilian government instituted the National Fund of Scientific and Technological Development (FNDCT) as an instrument for financing scientific and technological activities in the country. Since 1971, FINEP took over the executive secretariat of the FNDCT, while simultaneously continuing with its activities as a bank responsible for loans to feasibility studies and technological projects in the business sector.

A third institution of significance to the federal government in the area of support to the science is the Coordination for the Improvement of Higher Education (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* - CAPES), an institution within the Ministry of Education. Created in the beginning of the 1950's by a pioneer of educational reforms, Anísio Teixeira, CAPES created graduate³ scholarships for studies within the country and abroad, coordinated programs of international cooperation with various countries and maintains, since

³ "Graduate education", in this text, refers to studies leading to masters and doctoral degrees.

1977, a highly prestigious and recognized system of regular evaluation of the graduate programs in the country (Castro and Soares 1986).

CNPq, CAPES and FINEP are currently responsible for the administration of the Program for Support of the Scientific and Technologic Development (PADCT), a project financed together by the Brazilian government and the World Bank, oriented towards certain technological areas defined as priorities.

At the state level, the principal institution is the Research Support Foundation of the State of São Paulo (FAPESP), which since the beginning of the 1960's, administers a fixed percentage of the State of São Paulo's tax revenues (initially 0.5% and 1% in recent years). FAPESP provides grants to individual researchers in the form of research grants, scholarships, trips, organization of scientific events, and in recent years, it is providing larger grants to integrated projects bring together research, education and the acquisition of scientific equipment. Many other foundations of support to research were created or reformulated in the Brazilian states as a consequence of constitutional reforms during the latter half of the 1980's, but none have achieved the degree of institutionalization and importance that the FAPESP presents.

Finally, mention must be made to the activities of some international agencies supporting scientific research in Brazil. Other than the Rockefeller Foundation, it is worth mentioning the Ford Foundation that has been active in Brazil since the 1960's, concentrating its support in the area of social sciences and humanities; and other American and European institutions, a majority of which concentrate on matters related to living conditions of the most vulnerable population. The Kellogg Foundation that supports research in the area of medicine and the United Nations Development Program (UNDP). Governmental - and nongovernmental agencies of Canada, Sweden and Germany, among others, also deserve a special mention. The World Bank and the Interamerican Development Bank have granted substantial loans to the Brazilian government in the areas of science, technology and higher education, resources which were later transferred to the research institutions⁴.

⁴ Foreign institutions supporting research play an important role in Brazil, but they do not dominate. The Ford Foundation, in 30 years of involvement in the country, has used about 77 million dollars, concentrated mainly in the area of social sciences. The World Bank granted Brazil two sectorial loans for a group of specific areas in science and technology covering a series of activities for support to research and the

Dimensions of the system

The global estimation is that Brazil spends each year about 2 to 3 billion dollars, or 0.6% to 0.8% of the Gross National Product, on science and technology, of which 20 to 25% is provided by the productive sector (Wolff 1991). More detailed figures from the main governmental agencies are presented below.

The National Council for Scientific and Technological Development (CNPq) divides its activities into the following areas; "promotion", "research", and "information and diffusion of science and technology". Besides this, it is vested with the formal authority of planning the field of science and technology as a whole and it also carries out periodic evaluation of different areas of knowledge. According to official information, CNPq has spent a total of US\$ 349,292 million in 1990 (and in 1991, US\$ 371,098 million) on its various activities. These figures perhaps do not reflect the reality, principally for 1991, due to government restrictions on the effective disbursement of resources, even to authorized and contracted activities. The actions for promotion include scholarships in the country and abroad, support for research projects and support to national and international cooperation agreements, as well as research facilities. In 1990 the figure corresponded to 69% of the Council's total expenditures; in 1991 the contribution rose to 78%. The financial figures concerning CNPq's activities in 1990-1991 period can be seen in Table 1.

The Financing agency for Studies and Projects (FINEP) administers three main groups of resources. Its own resources, equivalent to about 14 million dollars in 1991, are loaned to national companies for projects of technological development. Besides this, FINEP functions as the executive secretariat of the National Fund for Scientific and Technologic Development (FNDCT), an item of the Brazilian budget for financing non-enterprise research with resources estimated at approximately 56 million dollars in 1991. It also administers part of the Program for the Support of Scientific and Technological Development (World Bank - Brazilian Government), amounting to approximately 40 million dollars for 1991 (See Table 2).

FINEP does not deal with individual researchers but with institutions. Its projects have had an important role in the establishment

formation of human resources. The budget of the first program, from 1985 to 1988, amounted to 179 million dollars, of which 107 million from Brazilian side; and the second, which started in 1992, of 300 million, of which 196,6 were national resources.

TABLE 1
CNPq, EXPENDITURES REALIZED IN 1990-1991 (in US\$ thou.)

	1990		1991	
	Value	Percentage	Value	Percentage
Promotion	241,380.90	69.11	289,684.40	78.06
Research	47,051.50	13.47	33,237.90	8.96
Science and Technology Information Diffusion	8,269.80	2.37	5,226.50	1.41
Administration	37,439.80	10.72	27,677.60	7.46
Others	15,150.00	3.34	15,272.30	4.12
Total	349,292.30	100.00	371,098.70	100.00

Figures furnished by CNPq, already converted to US\$.

TABLE 2
FINEP, CONTRACTED OPERATIONS, 1989-1991 (US\$ million)

Year	1989	1990	1991
FINEP resources, Total	24,447.29	7,443.17	14,832.17
ADTEN	22,622.92	7,202.19	13,391.78
AUSC	1,824.38	240.98	1,440.39
Resources FNDCT	132,007.57	95,899.81	56,602.50
Resources PADCT	22,721.02	9,081.06	40,037.49
Total	179,175.89	112,424.04	111,472.16

and maintenance of leading centers of scientific and technological research in the country, as well as in the social area. The average value of the approved projects in 1991 are relatively low - between 150 and 300 thousand dollars for multiannual projects - suggesting that this role of institutional support has ceased. Table 2 shows that there has been a drastic fall in FNDCT's resources, not compensated by PADCT, which was anyway conceived as an additional program and not as a substitute for regular governmental financing of scientific and technological research.

CAPES concentrates its activity to awarding scholarships for graduate education in a form similar to CNPq. From a budget of approximately US\$ 110 million in 1991 (approximately 7 billion *cruzeiros*, converted at an average exchange rate of Cr\$ 74.00 per dollar), 95% of the resources were dedicated to scholarships and the rest to other activities, including self administration. Table 4 presents some information about scholarships maintained by CAPES in 1990 and 1991. The abbreviation "PICD" stands for Integrated Program of Capacitation of Teachers, which consists of scholarships extended to teachers from Federal Universities in order to complete their graduate studies, generally in other Brazilian universities. The other scholarships in the country are given in response to solicitations coming from graduate programs, according to periodical evaluations, and classified under "social demand". It is interesting to note that 35% of CAPES resources are channeled to scholarships abroad. CAPES' activities include small grants to graduate programs in the country, which are proportionate to the number of scholarships they receive.

The fourth most important institution supporting research in Brazil is the Research Support Foundation of the State of São Paulo (FAPESP). In contrast with federal institutions, FAPESP dedicates a larger percentage of its resources to the support of research projects, and its administrative costs are legally limited to a small percentage of the total budget. More recent information concerning FAPESP is presented in Table 3.

Although not being strictly comparable, the figures from the main Brazilian agencies for research support show some significant patterns. The first is the degree of resource instability, partially revealed in the information of FINEP and CNPq. In part, these variations reflect the fact that FINEP is specializing more and more in activities supporting industrial technology, leaving CNPq to finance academic and university research. But they reflect mainly the budget instability at a period of high inflation that Brazil is going through, and the absence of a clear and well defined policy for the sector of Science and Technology on part of the government. Expansionary periods do not necessarily mean well-defined priorities, but instead, response to pressure and short-term conveniences that are followed by practically absolute restrictions. The distancing on the part of FINEP, of the activities of institutional support to research centers and laboratories inside and outside of universities, has not been compensated by any other agency leaving the research centers of the country without adequate sources of institutional support, apart from the

salaries paid to the university teachers and researchers of the governmental institutes.

It also draws attention to the large number of scholarships awarded by CAPES and principally by CNPq. The total number of scholarships extended by the Brazilian agencies in 1990 numbered more than 40,000 and must be seen in comparison with the total number of students registered in graduate courses in Brazil, 3,967 at doctoral level and 42,205 at masters level in 1989 (Castro 1991). This means that practically all graduate students have access to a scholarship, be it for course work, for thesis writing, or for the continuation of their studies abroad. Compared with CNPq, FAPESP gives greater weight to doctoral scholarships, which is explained by the fact that the majority of the doctoral programs of the country are concentrated in São Paulo. It is also worth noting that the awarding of scholarships for doctoral studies abroad does not necessarily imply that these doctorates are obtained. There are no figures available concerning the completion of courses followed abroad, nor about the assimilation of these scholarship-holders by Brazilian institutions.

Besides student scholarships, CNPq gives a large number of "research scholarships", which are in reality a supplement to the teacher's and to the full-time researcher's salary, channeled through the presentation of a project, and renewed periodically. Recently, both CNPq and CAPES have introduced scholarships to dissuade "senior" teachers from voluntary retirement (that according to actual legislation, can be obtained before 50 years, with full salary), or to encourage retired teachers to get involved in research activities. Finally, both CNPq and CAPES offer scholarships to young doctorate degree holders, especially the ones educated abroad, looking for their stabilization in national institutions.

In global terms, the CNPq pattern is the opposite of FAPESP's; while this one dedicates more than 80% of its resources for research support, CNPq dedicates more than 80% of its resources for study scholarships. With the finance restrictions of 1991-1992, CNPq did not distribute resources for research projects approved by assessment committees, trying to maintain, however, the distribution of study scholarships both in the country and abroad⁵.

⁵ Late in 1993 CNPq announced to those awarded with research grants in 1991 that it was granting them about 1/5 of their original requests, in an attempt to keep at least some of its credibility in the scientific community.

SCIENCE AND TECHNOLOGY

TABLE 3

RESEARCH SUPPORT FOUNDATION OF THE STATE OF SÃO PAULO

	Nr. of approved requests	US\$ value in 1000*	Percentage	Average value per request
Research Project Support	960	94,275.50	82.40	98.20
Organization of Academical Events	180	1,274.87	1.11	7.08
Participation of meetings in Brazil	144	74.45	0.07	0.52
Participation of meetings abroad	272	624.87	0.55	2.30
Visiting Brazilian Teachers	13	129.97	0.11	10.00
Visiting foreign Teachers	185	716.87	0.63	3.87
Publications	64	645.54	0.56	10.00
STUDY SCHOLARSHIPS IN BRAZIL				
Scientific Initiation	755	1,971.28	1.72	2.61
Improvement	33	128.09	0.11	3.88
Masters	675	4,129.33	3.61	6.12
Doctorate	317	3,506.47	3.06	11.06
Post-Doctorate	37	663.82	0.58	17.94
STUDY SCHOLARSHIPS ABROAD				
Post-Graduation	69	2,020.65	1.76	29.28
Post-Doctorate	277	4,337.62	3.79	15.66
Total	3,981	114,503.34	100.00	

* Calculated by the average exchange rate of Cr\$ 409.83 per dollar
Source: FAPESP, direct information

Brazilian science and support institutions

One way to estimate the dimensions of the Brazilian scientific community is the number of research projects approved annually by CNPq and FAPESP - from 2 to 3,000 in CNPq, and 1,000 in FAPESP, in recent years. If we estimate that one in every two active researchers present one request for financial support per year, and that the requests are individual, and that one in every two requests is approved, we get

SCIENCE AND TECHNOLOGY

an estimate of 4,000 projects a year, involving a total of 16,000 researchers. This number is compatible with the quantity of university professors with doctorate titles or equivalent (about 16,000) or 12.7% of the total of university teachers counted by the Ministry of Education, of which 12,000 are employed full-time. Other than university teachers, there are also researchers in the Institutes of CNPq in the State of São Paulo and in some other important public institutions, like the Brazilian Corporation for Agricultural Research (EMBRAPA), the Oswaldo Cruz Institute in Rio de Janeiro, etc.

TABLE 4

STUDY SCHOLARSHIPS AVAILABLE FOR POST-GRADUATION IN BRAZIL

AND ABROAD, 1990

	CNPq	CAPEs	FAPESP	TOTAL
Scientific Initiation	5,887	889	755	7,531
Educational Improvement in the country	2,389	11	33	2,433
Educational Improvement abroad(*)	80	82		162
Masters in the country	8,661	10,804	675	20,433
Masters abroad(**)	89	215		304
Doctorate in the country	2,637	3,444	317	6,398
Doctorate abroad(***)	923	1,242	69	2,234
Post-doctorate in the country	45		37	82
Post-doctorate abroad	373	114	227	714
Research Scholarships	3,594	289		3,883
Without specification		103		103
TOTAL	24,678	17,193	2,113	43,984

(*) Includes specialization

(**) Includes "sandwich" scholarships.

(***) Includes "sandwich" scholarships.

When aggregated, the figures of the agencies show a total availability of 747.7 million dollars, of which 289.1 for support of research projects, and 319.3 million to scholarships⁶. These figures do not include

⁶ It is important to note that these figures can only be added to give an idea of the system's dimension, since they refer to different years, different forms of payment (including pluriannual contracts) and great uncertainties as for the effective reimbursements since at least 1991.

salaries of teachers and researchers which are paid by the Ministry of Education, in the case of the federal universities, and by state governments in the case of state universities, or by other administrative agencies. If we estimate an annual salary of 20,000 dollars for each one of the 12,000 university professors working full time with a doctorate degree or higher, we would have a total of 240 million dollars annually, increasing expenditures to a total of one billion dollars (it is worth observing that, besides this, state and municipal universities employ a total of 54,000 teachers on full time, 42,000 of them with title inferior to a doctorate). Dividing the total of 289.1 million dollars by the 12,000 teacher-doctors on full time, will give us an approximate value of 24,000 dollars of research resources per researcher, on an average.

Conclusion

The hyperinflation and recession so characteristic to the Brazilian economy in the 1990's have dramatically affected the scientific community. Salaries fluctuate; there is great uncertainty about the availability of resources; contracts signed by government agencies in many cases are not fulfilled; and the majority of the institutions ceased to employ young researchers, including those having acquired degrees abroad with government resources. Besides, the policies of autarchical scientific development, that justified many of the past investments are today viewed critically, and the ideal of science as culture, formation and exploration of new frontiers, without the obligation of practical results in short term does not find much receptivity.

Despite all this, the analysis of the figures shows that the structure created in Brazil for the support of scientific and technological research since the 1970's, continues to remain relatively intact, despite some obvious distortions, such as the excessive resource concentration on scholarships by CNPq in a period of little employment opportunities and the reduction of FINEP's role in the institutional support to the regular maintenance of centers of research, or the large number of teachers with full-time jobs, which assumes a strong dedication to research, but without the appropriate academic title and qualification. Once the economy is stabilized, the question will be not just to correct these distortions, but principally to evaluate whether the quality and the direction of the research work that has developed in the country in the last decades is adequate for the present time, characterized by open economies, intense international competitiveness and a shrinking role of the state as provider of support to basic research. It is an extremely

difficult discussion that should become more manageable, however, as long as basic resources to support the functioning of the vital metabolism of the Brazilian scientific community continue to exist.

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SCIENCE AND TECHNOLOGY

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